Swiss Epidemiology Winter School 2014

Mathematical Modelling in Infectious Disease Epidemiology (ws14-6)

January 23-25, 2014

Faculty

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Introduction

Modelling of the dynamics of infectious diseases is becoming increasingly important for improving understanding about transmission and the potential impact of public health interventions. In this course, students will be introduced to the basic concepts of mathematical modelling of infectious diseases such as the basic reproductive number, R_0. We will further discuss issues such as vaccination thresholds, stochastic effects during epidemic growth and sexual networks. The students will be able to work on real-life applications of infectious disease modelling with case studies of influenza and chlamydia, a bacterial sexually transmitted infection. Exercises will be conducted in the programming language R. Previous knowledge of R will be useful but is not essential.

Course objectives

- To understand the role of infectious disease dynamics for research and health care
- To become familiar with the basic concepts of mathematical models of infectious diseases
- To use simple mathematical models to study disease transmission and control interventions

What you have to bring

Students will bring their own laptops with an installed version of the R software environment for statistical computing. R runs on Windows, Mac OS X and Linux and can be freely downloaded at http://www.r-project.org.

Outline of course

The course will run over three days and consists of lecturs in the morning and computer practicals during the evening. During the extended break in the afternoon, participants review course materials, catch up on emails or go skiing.

Thursday

- Introduction to mathematical epidemiology
- Basic concepts of population dynamics
- Compartmental models (SEIRS; susceptible-exposed-infected-recovered)
- Basic reproduction number R0, vaccination thresholds
- Computer exercises: Getting started with R (installing necessary packages), simulating an influenza epidemic, exploring the impact of vaccination

Friday

- Parameter inference and seasonal forcing
- Stochastic effects (observational and process noise)
- Gillespie algorithm
- Computer exercises: Investigating stochastic effects during an infection outbreak

Saturday

- Global control of sexually transmitted infections (STIs)
- Determinants of STI transmission (sexual networks)
- Modelling the transmission of STIs (individual-based models)
- Computer exercises: Studying the spread of STIs in sexual contact networks

Maximum number of participants

The maximum number of participants on this course will be 25.

Course fee

Academic:	CHF 900
Industry:	CHF 1500

Course hotels

See www.epi-winterschool.org